CLAIMS

1. A material suitable for use in a solid oxide fuel cell, wherein the material is of an, optionally doped, double perovskite oxide material having the general formula I:

$(Ln_aX_b)_e(Z^1_cZ^2_d)_fO_g$ (I)

wherein Ln is selected from Y, La and a Lanthanide series element, or a combination of these and X also represents an element occupying the A site of a perovskite oxide and is selected from Sr, Ca and Ba, and Z^1 and Z^2 represent different elements occupying the B site of a perovskite oxide and are selected from Cr, Mn, Mg and Fe, and wherein a has a value from 0 to 1, preferably, 0.7 to 1.0, b has a value of from 1 to 0, preferably 0.3 to 0, and each of c and d has a value of from 0.25 to 0.75, provided that a + b has a value of 1, and c + d, has a value of 1, and wherein e has a value of from 0.8 to 1, wherein f has a value of from 0.8 to 1, and g has a value of from 2.5 to 3.2.

2. A material as claimed in claim 1 wherein Z^1 and Z^2 represent Cr and Mn, respectively.

3. A material as claimed in claim 1 or claim 2 wherein X represents Sr.

4. A material as claimed in any one of claims 1 to 3 wherein is provided a B site dopant selected from V, Fe, Cu, Co, Ru, Ni, Pd, Ce, Ti, Nb, Mo and Mg.

5. A material as claimed in claim 4 wherein the dopant is present at a level of not more than 20%.

6. A material as claimed in claim 5 wherein the dopant is present at a level of from 5 to 20%.

7. A material as claimed in any one of claims 1 to 6 wherein in general formula I each of c and d has a value of at least 0.4.

8. A material as claimed in any one of claims 1 to 6 wherein at least 30% of the B sites are occupied by a third element Z^3.

9. A material as claimed in any one of claims 1 to 8 wherein, in general formula I, a has a value of from 0.7 to 0.9.

10. A material as claimed in claim 9 wherein, in general formula I, a has a value of from 0.72 to 0.85.

11. A material as claimed in any one of claims 1 to 10 which has a porosity of at least 20%.

12. A material as claimed in claim 11, which has a porosity of from 40 to 50%.

13. An SOFC having an electrode or functional layer of a material or containing a material as claimed in any one of claims 1 to 12.

14. An SOFC having an anode of a material as claimed in any one of claims 1 to 12.

15. A mixed ionic/electronic conducting membrane comprising a layer of a double perovskite material according to claim 1.

16. A membrane as claimed in claim 15 wherein said layer of double perovskite material comprises a protective layer on at least one side of a mixed ionic/electronic conducting ceramic membrane.

17. A mixed ionic/electronic conducting membrane suitable for use in a syngas reactor, which membrane comprises a layer of a double perovskite material according to claim 1.

18. A syngas reactor having a mixed ionic/electronic conducting reactor membrane, which membrane comprises a layer of a double perovskite material according to claim 1.

19. A mixed ionic/electronic conducting membrane suitable for use in an oxygen separator, which membrane comprises a layer of a double perovskite material according to claim 1.

20. A method of oxidising a fuel in an SOFC, comprising the steps of:
a) providing an SOFC having an anode of the material as claimed in any ones of the claims 1 to 12; and
b) applying a voltage to said SOFC so as to oxidize said fuel.

21. A method as claimed in claim 20 wherein is used a fuel selected from hydrogen; a hydrocarbon fuel compound; a hydrocarbon based fuel compound; and a non-hydrocarbon hydride fuel compound, or a said fuel after at least partial reformation thereof.